4314A/B

Digital Igniter Tester

Instruction and Maintenance Manual

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REV. 9-85

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SECTION I — GENERAL INFORMATION

1.1 DESCRIPTION

The Valhalla Scientific Series 4314 Digital Igniter Testers are available with various input range combinations. Otherwise, all Model 4314's are identical. Subsequent discussion applies to all Model 4314's unless specific exceptions are noted.

The Valhalla Scientific Model 4314 Digital Igniter Tester is designed specifically to test the igniters used to detonate charges in explosive bolts and similar remote release devices. This tester was designed with one major objective: to make it absolutely failsafe.

1.2 FAIL-SAFE OPERATION

The Model 4314 Digital Igniter Tester incorporates internal protective circuits which render it incapable of delivering excessive voltage or current to the igniter under test. A detailed description of the fail-safe circuits is contained in paragraphs 4-6 and 4-8. The meter was pretested at the factory where component failure was simulated to duplicate a failed mode. The resulting fail-safe current levels were recorded and supplied as part of the original calibration information. As a further precaution, the possibility of an external common-mode voltage delivering unwanted power to the igniter is eliminated by operating the Model 4314 from an internal battery pack. Thus, it is totally isolated from the AC power line. An external line-powered charger is included with the Model 4314 for recharging the battery pack.

1.3 ACCESSORIES

The Valhalla Scientific Model 4314 is shipped from the factory with a rechargeable nickel cadmium battery pack, an external charger and an instruction manual. The batteries are packed separately in the same shipping container with the 4314. Observe polarity marks on the bottom of the battery holder when installing batteries. Although batteries are shipped from the factory fully charged, some recharging might be necessary to insure a fully charged condition.

1.4 OPTIONAL EQUIPMENT

There are several optional equipment items available for the Series 4314 Digital Igniter Testers which are listed in Table 1-1.

Table 1-1. Optional Equipment Items.

Option "BCD-MX"	Data Outputs
Option "CC4"	Meter and Accessory Carrying Case
Option "HDB"	Spare Battery Pack
Option "JAWS"	Heavy Duty Kelvin Clips
Option "KCS"	Kelvin Clip Set
Option "K"	Kelvin Clip Cable Set (with KCS)
Option "KK"	Kelvin Cable Set (with JAWS)
Option "MP-1"	Kelvin Micro Probes
Option "MP-2"	Kelvin Mini Probes
Option "R4"	Rack Mount Adapter

SECTION II — INSTALLATION

2.1 INTRODUCTION

This section outlines the procedure for inspecting and installing Valhalla Scientific Series 4314 Digital Igniter Testers.

2.2 INITIAL INSPECTION

Before accepting the instrument from the shipper, inspect the shipping container for signs of external damage. If any damage is noted, either before or after acceptance, advise the carrier immediately.

Unpack the instrument and keep the shipping container until the instrument has been inspected for shipping damage. If damage is evident, contact the carrier and Valhalla Scientific for authorization to return the instrument to Valhalla Scientific for repairs.

If the container is damaged, but the instrument appears to be intact, perform the calibration procedure outlined in Section V to be sure that the instrument has incurred no hidden damage.

2.3 POWER REQUIREMENTS

The Valhalla Scientific Model 4314 is supplied with a self-contained rechargeable nickel cadmium battery pack and an external charger. Although the battery pack is charged prior to shipment it is desirable to refresh the charge before using the instrument.

2.4 BATTERY PACK CHARGING

To refresh the battery pack before initial use, connect the AC power input of the charger to a 115-volt AC power outlet. Charge for eight to sixteen hours.

The normal operating time between battery pack recharges is eight hours of continuous duty. It is recommended that the Model 4314 battery pack be recharged overnight when not in use to insure that it is ready when needed. Sixteen hours of recharge time is required after eight hours of continuous use.

2.5 INSTALLATION

The Model 4314 draws little power and generates virtually no heat. Consequently, it will function properly in any area where the ambient temperature does not exceed its specified temperature range.

2.6 BCD-MX CONNECTIONS

The BCD-MX Option provides BCD outputs for operation of external. An instrument equipped with this option has a rear-panel mounted connector with pin assignments as listed in Table 2-1. All outputs are positive, active high logic capable of driving one TTL load. The BCD data is valid when the STROBE signal is high.

Table 2-1. BCD-MX Connector Pin Assignments.

Pin Nos.	Function
1, 6, 11, 16	1 BIT
2, 7, 12, 17	2 BIT
3, 8, 13, 18	4 BIT
4, 9, 14, 19	8 BIT
21	10,000 COUNT
22, 23, 24, 50	GND
29	10^0 STROBE
30	10^1 STROBE
31	10^2 STROBE
32	10^3 STROBE
5, 26, 33	+5V

SECTION III — OPERATION

3.1 INTRODUCTION

This section of the manual contains complete operating instructions for the Series 4314 Digital Igniter Testers. Included is a description of the front panel controls and their functions.

3.2 FRONT PANEL

When the front panel power switch is placed in the OFF/CHARGE position, all power is removed from the output terminals, and the battery pack is connected to the charging circuit. When the switch is placed in the ON position, the battery pack is disconnected from the charging circuit. The possibility of a common mode voltage between the igniter and AC Power Ground is, therefore, eliminated. The operator need not be concerned if the AC Power Charging Adapter is plugged in while measuring igniter resistance.

3.3 RANGES

The Model 4314 input range is selected by depressing the desired button on a multi-station interlocking pushbutton array located on the right-hand side of the front panel. The pushbutton for the highest range is nearest to the POWER switch.

3.4 IGNITER RESISTANCE MEASUREMENTS

With the charger disconnected and the input cable connected to the Model 4314, connect the Kelvin clips to the igniter. Depress the desired RANGE switch pushbutton. Depress the POWER pushbutton. Observe the reading on the digital display. A blinking display indicates the resistance to be measured exceeds the full scale range selected. Select a higher range if this occurs.

SECTION IV — THEORY OF OPERATION

4.1 INTRODUCTION

The Valhalla Scientific Model 4314 Digital Igniter Tester is shown in block diagram form in Figure 4-1. It consists of an analog-to-digital (A/D) converter and an ohms-to-DC converter. Its output is a DC voltage precisely proportional to the igniter resistance. This precise DC voltage is converted from analog to digital form by the A/D converter and displayed as a resistance value.

The Model 4314 uses solid state semiconductors exclusively, and C-MOS circuits extensively, the latter minimizing power requirements and making battery pack operation practical.

4.2 CIRCUIT DESCRIPTION

The circuit descriptions which follow are referenced to the block diagram of Figure 4-1 and the schematic diagram of Figure 5-5.

4.3 A/D CONVERTER

The Model 4314 incorporates a three-step integrator to convert the ohms-to-DC converter output from analog to digital form (see Figure 4-1). The initial step, or RESTORE mode, lasts for 200 milliseconds. During this period the input to preamplifier IC12 is grounded through one section of quad-bilateral switch IC2. Sample-and-Hold switch Q15 is ON, closing the feedback loop around integrator IC13 and zero detector IC14. This forces the zero detector output to zero, and capacitor C21 charges to the level of any offset voltage present in the preamplifier, integrator and zero detector. This charge on C21 will cancel the effect of any zero drift or offset originating in the analog section of the A/D converter during the period when the ohms-to-DC converter output is being integrated.

With capacitor C21 charged to offset any zero error present, the second step of the

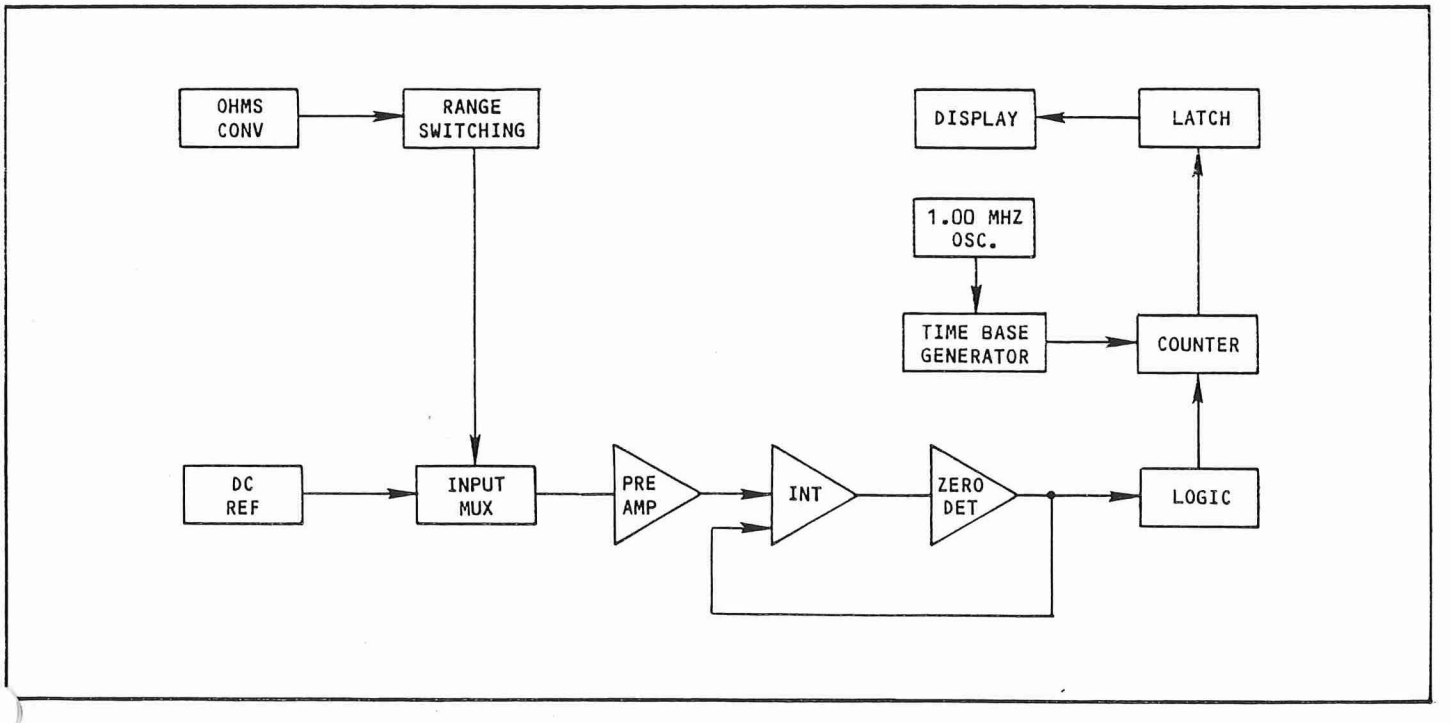


Figure 4-1. Block Diagram of Digital Igniter Tester.

4.6 CONSTANT CURRENT SOURCE

The constant current source comprises two sections of IC15, IC17, Q8, DS6 and associated components. The input to the constant current source is approximately +1.05 volts, developed at IC15-1 and coupled to IC15-13 through R58 and R59.

The heart of the constant current source, and the major factor that makes the Model 4314 absolutely failsafe, is the voltage-to-current converter, which incorporates a transconductance amplifier (U.S. Patent No. 4,091,333). A simplified schematic of this unique circuit is shown in Figure 4-3. The first amplifier, IC15-12, -13 and -14 is an inverter, and its output is applied to IC15-9. The amplifier comprised of IC15-8, -9 and -10 has unity gain due to the feedback through R74. Its output is applied to the inverting input at IC17-3. The output of IC17-6 provides feedback to the non-inverting input at IC15-10. This circuit operates to maintain the inverting input at IC17-3 and the non-inverting input at IC17-2 at the same potential.

4.7 TRANSCONDUCTANCE AMPLIFIER OPERATION

Assume that terminals I_{hi} and I_{lo} of Figure 4-3 are shorted, and 1 volt is applied to the transconductance amplifier so that I_{hi} is positive. To equalize the inputs at IC17-2 and IC17-3, IC15-8 must be driven to zero. This condition occurs only when the voltage drops across R73 and R77 are equal to the drops across R74 and R76. For these voltage drops to be equal, the output at IC17-8 must be at +1 volt. Since the output at IC15-8 must be zero, the drop across R74 is 0.5 volt, making the inverting input 0.5 volt. The drops across R73, R76 and

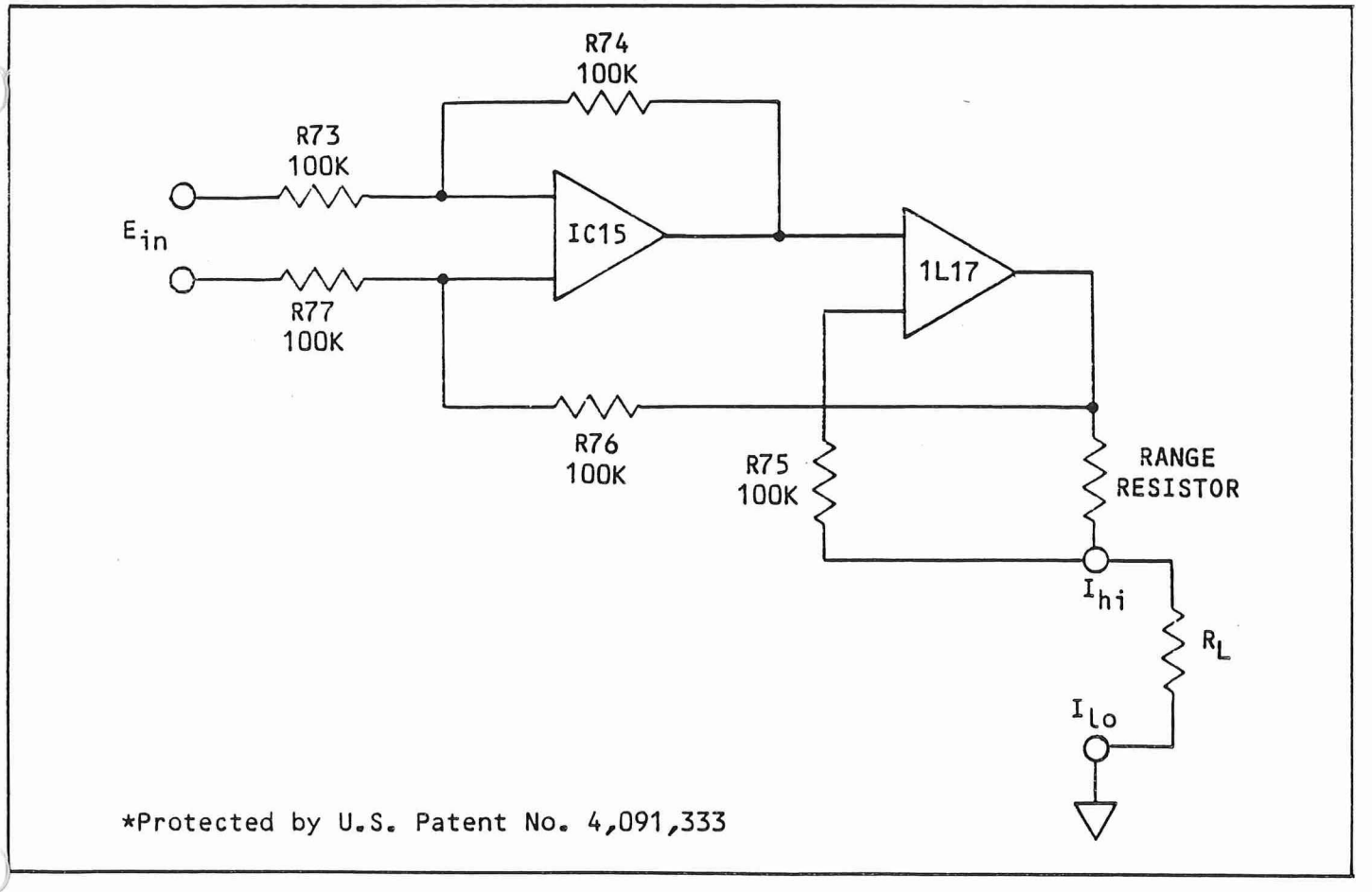


Figure 4-3. Simplified Diagram, Transconductance Amplifier.

SECTION V — MAINTENANCE

5.1 INTRODUCTION

This section of the manual contains maintenance information for the Valhalla Scientific Series 4314 Digital Ingiter Testers. It includes a list of required test equipment and a calibration procedure.

5.2 REQUIRED TEST EQUIPMENT

The following items of test equipment are required for calibration of the tester.

Precision Resistors
- 0.1 ohm ±0.01% Accuracy
- 100 ohms ±0.005% Accuracy

5.3 CALIBRATION PROCEDURE

The following procedure should be performed on a routine basis to insure that the instrument remains in calibration. It should also be performed after repair or replacement of any accuracy-determining component. Allow five minutes warmup time after instrument turn-on before beginning the calibration procedure.

5.3.1 ZERO CALIBRATION

1. Select the 100 OHMS range. Connect the Kelvin clips of the input cables to a shorting bar.

2. Adjust R3 to its end stop closest to the front panel. Adjust R60 for a 0000 reading on the panel display.

5.3.2 RANGE CALIBRATION

1. Select the 100 OHMS range. Connect the Kelvin clips to the 0.1 ohm precision resistor. Adjust R3 for a 0010 reading on the panel display.

2. Connect the Kelvin clips to the 100 ohm precision resistor. Adjust R69 for a display value of fullscale ±2 digits.

3. Check and verify calibration of the remaining ranges of the instrument to the specifications listed in front of this manual.

5.4 TROUBLESHOOTING

Apparent difficulties are often due to misinterpretation of the specifications or to noise pickup at the instrument input. Be sure the instrument is truly malfunctioning before attempting repairs.

When attempting to repair a complex instrument, localize the malfunction to the greatest possible extent before beginning the actual process of troubleshooting individual components. For example, if a malfunction is not on one range, check performance on the other ranges to determine whether the malfunction is common to all. This approach saves time and eliminates needless component changes.

Figure 5-1 functionally describes the gates used in the Model 4314. All logic used in the Model 4314 is positive "1" state.

5.4.1 POWER SUPPLIES

The +5 volts supply is derived directly from the battery pack. The battery pack voltage will vary from 4.5 to 6.4 volts, depending on battery condition. The -5 volts supply is obtained from a regulated DC/DC converter comprised of Q11, Q12, T1 and IC22. The -10 volts supply is obtained at the junction of CR19 and CR20.

SECTION VI — PARTS LISTS

6.1 GENERAL

The parts lists of this section are reproductions of factory parts lists. The designators are those of the diagrams in Section V. When ordering replacement parts, provide the reference designator, manufacturer's part number, manufacturer's name and Valhalla part number if contained in the parts list. The manufacturer is identified in the parts list by a federal stock number. A list of manufacturer's federal stock codes is provided as an appendix to this manual for identification of manufacturer's.

Valhalla Scientific Inc.	PARTS LIST	UNIT ASSY "DC"	MODEL 4314	DWG NO 4314-400	REV G

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY. I	QTY. N	I	N		REMARKS
1	B1-4	5-10117	Battery H.D. Nicad	Gould	3.5AH	4					
2	Q17	3-10010	Transistor	07263	2N4402	1					
3	C1-2,8,34	2-10009	Cap Cerm .001uf	56289	5GAD10	4					
4	C4	2-10002	Cap Cerm 500pf	56289	5GAT50	1					
5	C5, 6	2-10010	Cap Cerm 39pf	56289	5GAQ39	2					
6	C7,25,33,35	2-30001	Cap Tan 10uf 25V	05397	T360B106M025AS	6					
	41, 20										
7	C36,10-13, 3	2-10000	Cap Cerm .005uf	56289	5GAD50	6					
8	C21	2-50000	Cap Poly .22uf	27556	PA2A224	1					
9	C22	2-10005	Cap Cerm 50pf	56289	5GAQ50	1					
10	C23	2-10004	Cap Cerm .02uf	56289	5GAS20	1					
11	C26, 27	2-10007	Cap Cerm 330 pf	56289	5GAT33	2					
12	C32	2-30003	Cap Tan 47uf 10V	05397	T360B476M010AS	1					
13	C44	2-40004	Cap Elect 2200uf	30039	16T2200	1					
14	CR2,12-16,19	3-20000	Diode	07263	IN4001	6					
	20, 29, 30										
	CR18,3-6, 9	3-20002	Diode, Rect	07263	1N4148	10					
15	CR17	3-20041	Diode Zener	02763	IN821 (825)	1					
16	DS1	5-01020	LED 1 Display	28480	QDSP-3789,Bin "B"	1					
17	DS2-5	5-01010	LED 0-9 Display	28480	5082-7650C	4					
18	DS6	5-01005	LED, Red		5082-4480 (HLMP 1000)	1					
19	F1	5-04001	Fuse Slo-Blo	75915	2A	1					
20	IC1	3-30022	IC Level Shifter	86684	CD4054AE	1					

NOTES:

Valhalla Scientific Inc.	PARTS LIST	UNIT ASSY "DC"	MODEL 4314	DWG NO 4314-400	REV G

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY. I	QTY. N	I	N		REMARKS
44	R5, 25-27,75	1-01081	Res Fxd 100 K 1/4W 5%	81349	RC07GF104J	6					
	106										
45	R8	1-01120	Res Fxd 12 M 1/4W 5%	81349	RC07GF126J	1					
46	R9	1-01119	Res Fxd 10 M 1/4W 5%	81349	RC07GF106J	1					
47	R18	1-01067	Res Fxd 24K 1/4W 5%	81349	RC07GF243J	1					
48	R19	1-01021	Res Fxd 100 1/4W 5%	81349	RC07GF101J	1					
49	R58, 104		Factory Select								
50	R22	1-10038	Res Fxd 90.9K .1%	81349	RN60C9092B	1					
51	R23, 69	1-50000	Res Var 100 20%	71450	X201R101	2					
52	R24, 59, 62, 66	1-10037	Res Fxd 10K .1%	81349	RN60C1002B	7					
	68, 70, 71										
52	R28, 105,110	1-01061	Res Fxd 10K 1/4W 5%	81349	RC07GF103J	3					
53	R29	1-10039	Res Fxd 274K 1%	81349	RN60C2743F	1					
54	R30	1-01080	Res Fxd 91K 1/4W 5%	81349	RC07GF913J	1					
55	R49	1-01018	Res Fxd 75 ohm 1/4W 5%	81349	RC07GF750J	1					
56	R73,74,76,77	1-10049	Res Fxd 100K .1%	81349	RN60C1003B	4					
57	R109, 54	1-01128	Res Fxd 1000M	81349	RC07GF108J	2					
58	R50, 55	1-01045	Res Fxd 2K 1/4W 5%	81349	RC07GF202J	2					
59	R51	1-01041	Res Fxd 1K 1/4W 5%	81349	RC07GF102J	1					
60	R52	1-01065	Res Fxd 20K 1/4W 5%	81349	RC07GF203J	1					
61	R53	1-01051	Res Fxd 3.9K	81349	RC07GF392J	1					
62	R56, 113, 121	1-01007	Res Fxd 10 1/4W 5%	81349	RC07GF100J	3					
63	R57	1-01097	Res Fxd 750K 1/4W 5%	81349	RC07GF754J	1					

NOTES:

Valhalla Scientific Inc.	PARTS LIST	UNIT ASSY "DC"	MODEL 4314	DWG NO 4314-400	REV G

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY. I	QTY. N	I	N		REMARKS
88		4-10529	4314A front panel, screened	Valhalla	4314-100	1					
89		5-10198	1/8" spacer	Smith	8880	4					
90		5-10199	Fibre Washer	Smith	2161	4					
91			#4 x 1/2 lg. Self tapping screw			4					
92		4-10130	Chassis	PacTec	CH-250 Beige	1					
93		5-10521	Fuse Holder Panel Mounting	Littlefuse	342004A	1					
94		4-10235	Rear Panel		4440-214	1					
95		5-10278	Dress Nut	C & K	7099	1					
96		5-10277	Silver Button	71590	B426	6					
97		5-10019	Cable Tie 4" x 1/8"	Panduit	WRN-4	20					
98			Wire:								
99			22 AWG, Orn		10 in.	1					
100			22 AWG, Blue		27 in.	1					
101			22 AWG, Black		33 in.	1					
102			22 AWG, White		4 in.	1					
103			22 AWG, Red		10 in.	1					
104			22 AWG, Buss		1 in.	1					
105			22 AWG, Purple		7 in.	1					
106											
107			14 AWG, Buss		3 in.	1					
108		5-10239	Velcro, Hook 8"	Un. Textile	VN06330HK 8"	1					
109		5-10240	Velcro Loop 8"	Un. Textile	VN06330LP 8"	1					

NOTES: *For unit assembly use 440-400 sheet 7 *For Main P. C. B. Assy. See 4314-600

*For Display PC Board see 4440-601-2 #For Wiring Info see DC 4314-051

Valhalla Scientific Inc.

PARTS LIST

MOD FOR MX

MODEL: 4314 with BCD/MX

DWG NO: 4314-401

REV: A

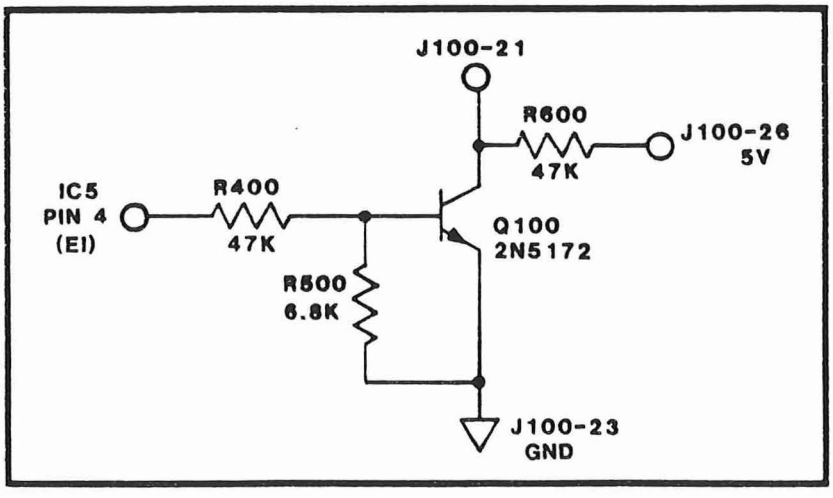
#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	I	N	I	N		REMARKS
		F.G.	STD 4314A	53504		1					
	DELETE:										
		4-10236	REAR PANEL	53504	4440-215	1					
	ADD:										
	Q100	3-10003	TRANS.		2N5172	1					
	R400,R600	1-01073	RES 47K ¼W	81349	RC07GF473J	2					
	R500	1-01057	RES 6.8K ¼W	81349	RC07GF682J	1					
	J100	5-10012	CONN BCD 50 PIN F		57-40500	1					
			REAR PANEL MX	53504	4440-218	1					
			SCREW, PHIL PAN CAD		2-56x3/8	2					
			WASHER, STAR		#2	2					
			NUT, HEX		2-56	2					
			WIRE:								
			22 BLK		88"	1					
			22 BUSS		12"	1					

NOTES:

SHT 1 OF 1

(ALL 10° THRU 10^{3} OUTPUTS ARE MULTIPLEXED)

4314		50 PIN CONNECTOR (J100)	DATA
IC7	Pin 23	1,6,11,16	1
IC7	Pin 24	2,7,12,17	2
IC7	Pin 1	3,8,13,18	4
IC7	Pin 2	4,9,14,19	8
IC7	Pin 8	29	10° STROBE
IC7	Pin 6	30	10^{1} STROBE
IC7	Pin 9	31	10^{2} STROBE
IC7	Pin 7	32	10^{3} STROBE
IC7	Pin 16	23,22,24,50	GND
R600		5,26,33	+5V



BCD-MX

Federal Supply Codes for Manufacturers

00656
Aerovox Corp.
New Bedford, Massachusetts

00686
Film Capacitors, Inc.
Passaic, New Jersey

00779
AMP Inc.
Harrisburg, Pennsylvania

00853
Sangamo Electric Company
Pickens, South Carolina

01121
Allen-Bradley Co.
Milwaukee, Wisconsin

01255
Litton Industries, Inc.
Beverly Hills, California

01281
TRW Electronic Comp.
Semiconductor Operations
Lawndale, California

01295
Texas Instruments, Inc.
Dallas, Texas

01686
RCL Electronics Inc.
Manchester, New Hampshire

02114
Ferroxcube Corp.
Saugerties, New York

02131
General Instrument Corp.
Westwood, Maine

02799
Areo Capacitors, Inc.
Chatsworth, California

03508
General Electric Co.
Syracuse, New York

03797
Genisco Technology Corp.
Compton, California

03877
Transistron Electronic Corp.
Wakefield, Massachusetts

03911
Clairex Corp.
Mt. Vernon, New York

04009
Arrow Hart Inc.
Hartford, Connecticut

04217
Essex International Inc.
Anaheim, California

04222
AVX Corp.
Myrtle Beach, Florida

04423
Telonic Industries
Laguna Beach, California

04713
Motorola Inc.
Phoenix, Arizona

04946
Standard Wire & Cable
Los Angeles, California

05276
Pomona Electronics Co., Inc.
Pomona, California

05277
Westinghouse Electric Corp.
Youngwood, Pennsylvania

05397
Kemet, Union Carbide Corp.
New York, New York

05574
Viking Industries
Chatsworth, California

05820
Wakefield Engineering Inc.
Wakefield, Massachusetts

06001
General Electric Co.
Columbia, South Carolina

06383
Panduit Corp.
Tinley Park, Illinois

06473
Bunker Ramo Corp.
Chatsworth, California

06555
Beede Electrical Instrument Co.
Penacook, New Hampshire

06743
Clevite Corp.
Cleveland, Ohio

07088
Kelvin Electric Company
Van Nuys, California

07256
Silicon Transistor Corp.
Chelmsford, Massachusetts

07263
Fairchild Semiconductor
Mountain View, California

07344
Bircher Co., Inc.
Rochester, New York

07597
Burndy Corp.
Rochester, New York

07716
I R C Incorporated
Burlington, Iowa

07910
Teledyne Semiconductor
Hawthorne, California

08065
Accurate Rubber and Plastics Co.
San Diego, California

08261
Spectra Strip Corp.
Garden Grove, California

08530
Reliance Mica Corp.
Brooklyn, New York

08806
General Electric Co.
Cleveland, Ohio

09026
Babcock Electronics Corp.
Costa Mesa, California

09214
G. E. Co. Semi-Conductor
Auburn, New York

09353
C and K Components
Watertown, Massachusetts

09922
Burndy Corp.
Norwalk, Connecticut

09969
Dale Electronics Inc.
Yankton, S. Dakota

11236
CTS of Berne
Berne, Indiana

11403
Best Products Co.
Chicago, Illinois

11503
Keystone Columbia Inc.
Warren, Michigan

11532
Teledyne Relays
Hawthorne, California

11711
General Instrument Corp.
Hicksville, New York

12014
Chicago Rivet & Machine Co.
Bellwood, Illinois

12060
Diodes, Inc.
Chatsworth, California

12136
Philadelphia Handle Co.
Camden, New Jersey

12405
Hysol Corporation
El Monte, California

12406
Elpac, Incorporated
Fullerton, California

12615
U.S. Terminals Inc.
Cincinnati, Ohio

12617
Hamlin Inc.
Lake Mills, Wisconsin

12697
Clarostat Mfg. Co.
Dover, New Hampshire

12969
Unitrode Corp.
Watertown, Massachusetts

13103
Thermalloy Co., Inc.
Dallas, Texas

13327
Solitron Devices Inc.
Tappan, New York

13454
Texas Crystals
River Grove, Illinois

13511
Amphenol Cadre Div.
Los Gatos, California

13606
Use 56289
Sprague Electric Co.
Concord, New Hampshire

14099
Semtech Corp.
Newbury Park, California

14655
Cornell-Dublier Electronics
Newark, New Jersey

14752
Electro Cube Inc.
San Gabriel, California

14936
General Instrument Corp.
Hicksville, New York

15801
Fenwal Electronics Inc.
Framingham, Massachusetts

15818
Teledyne Semiconductors
Mountain View, California

15849
Useco Inc.
Van Nuys, California

15898
International Business
Machines Corp.
Essex Junction, Vermont

16332
Replaced by 28478

16473
Cambridge Scientific Ind.
Cambridge, Maryland

16758
Delco Electronics
Kokomo, Indiana

17856
Siliconix, Inc.
Santa Clara, California

18324
Signetics Corp.
Sunnyvale, California

Federal Supply Codes for Manufacturers (cont.)

81095
Triad Transformer Corp.
Venice, California

81312
Winchester Electronics
Div. of Litton Industries Inc.
Oakville, Connecticut

81483
International Rectifier Corp.
Los Angeles, California

81741
Chicago Lock Co.
Chicago, Illinois

82389
Switchcraft Inc.
Chicago, Illinois

82877
Rotron Inc.
Woodstock, New York

82879
ITT Royal Electric Div.
Pawtucket, Rhode Island

83003
Varo Inc.
Garland, Texas

83298
Bendix Corp.
Eatontown, New Jersey

83330
Herman H. Smith, Inc.
Brooklyn, New York

83594
Burroughs Corp.
Plainfield, New Jersey

83740
Union Carbide Corp.
New York, New York

84171
Arco Electronics
Great Neck, New York

84411
TRW Electronic Components
Ogallala, Nebraska

84613
Fuse Indicator Corp.
Rockville, Maryland

84682
Essex International Inc.
Peabody, Massachusetts

86684
Radio Corp. of America
Harrison, New Jersey

88219
Gould Inc.
Trenton, New Jersey

88245
Litton Systems Inc.
Useco Div.
Van Nuys, California

88419
Cornell-Dubilier Electronic Div.
Fuquay-Varian, North Carolina

89730
G.E. Co
Newark, New Jersey

90201
Mallory Capacitor Co.
Indianapolis, Indiana

56365
Square D Co.
Chicago, Illinois

90303
Mallory Battery Co.
Tarrytown, New York

91094
Essex International Inc.
Newmarket, New Hampshire

91293
Johanson Mfg. Co.
Boonton, New Jersey

91506
Augat Inc.
Attleboro, Massachusetts

91637
Dale Electronics Inc.
Columbus, Nebraska

91662
Elco Corp.
Willow Grove, Pennsylvania

71468
Gremar Mfg. Co., Inc.
ITT Cannon/Gremar
Santa Ana, California

91802
Industrial Devices, Inc.
Edgewater, New Jersey

91833
Keystone Electronics Corp.
New York, New York

91929
Honeywell Inc.
Micro Switch Div.
Freeport, Illinois

92194
Alpha Wire Corp.
Elizabeth, New Jersey

93332
Sylvania Electric Products
Woburn, Massachusetts

94988
Wagner Electric Corp.
Tung-Sol Div.
Newark, New Jersey

95146
Alco Electronic Products Inc.
Lawrence, Massachusetts

95275
Vitramon Inc.
Bridgeport, Connecticut

95303
RCA Corp
Receiving Tube Div.
Cincinnati, Ohio

95348
Gordo's Corp
Bloomfield, New Jersey

95712
Bendix Corp.
Franklin, Indiana

97913
Industrial Electronic
Hardware Corp.
New York, New York

97945
Penwalt Corp.
SS White Industrial Products Div.
Piscataway, New Jersey

98278
Malco A. Microdot Co., Inc.
Connector & Cable Div.
Pasadena, California

98291
Sealectro Corp.
Mamaroneck, New York

98388
Royal Industries
Products Div.
San Diego, California

98978
IERC
Burbank, California

99120
Plastic Capacitors, Inc.
Chicago, Illinois

99217
Bell Industries Elect.
Burbank, California

99392
STM
Oakland, California

99515
ITT Jennings Monrovia Plant
Monrovia, California

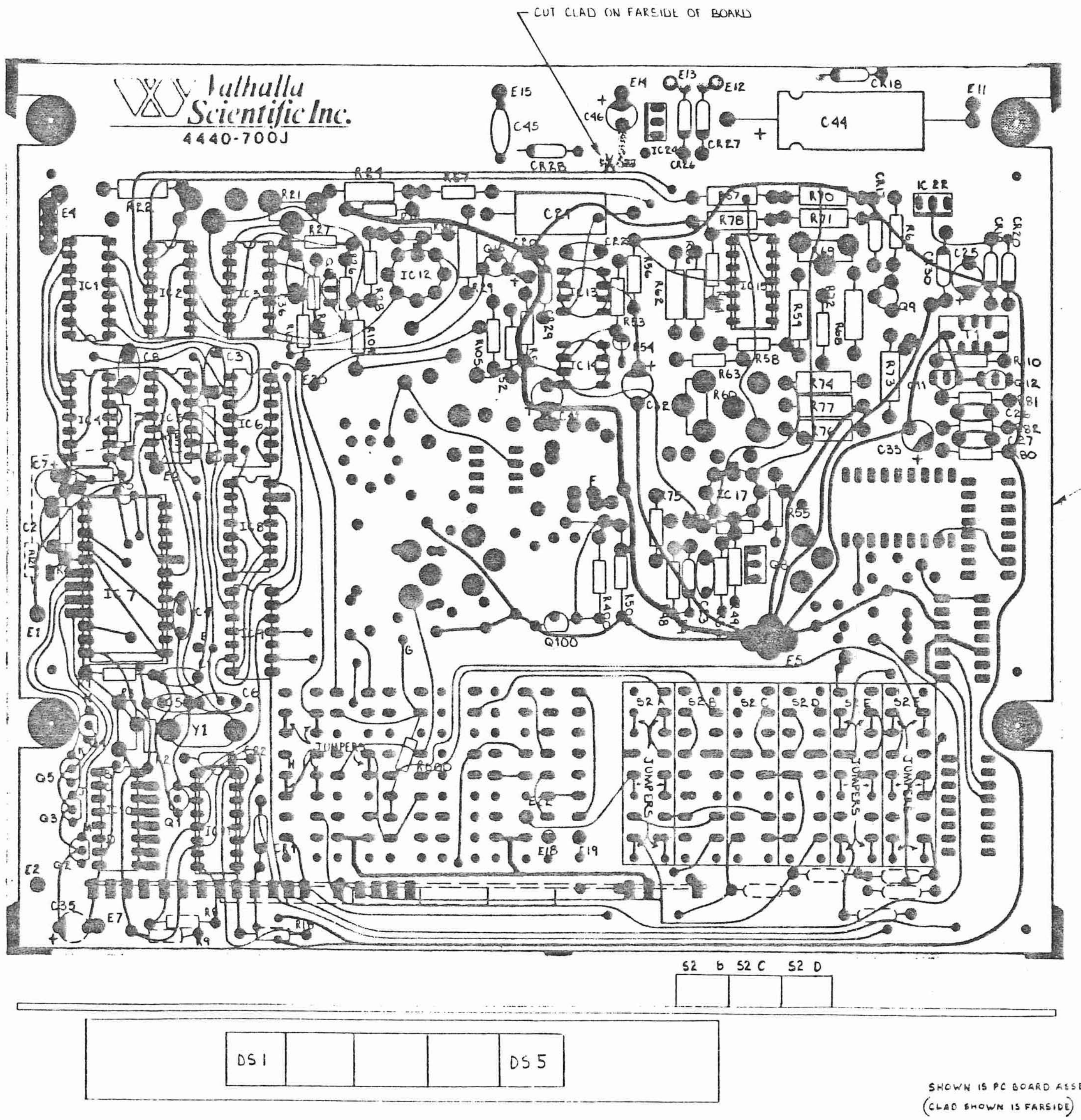
99779
Use 29587
Bunker-Ramo Corp.
Landsdowne, Pennsylvania

99942
Centrelab Semiconductor
El Monte, California

INTERNAL BATTERY PACK
4.5V TO 6.4V
ON
F1 2A
CHARGER CONNECTOR
POWER ON
-5V
-10V
NOT USED
NOT USED
2N5172
HITACHI IC7
CD4055AE IC 10
DS1
DS2
DS3
DS4
DS5
J1 I'HI
J2 IHI
J3 VLO
J5 ILO
T1

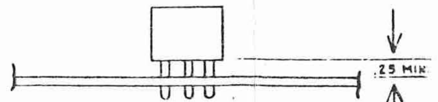
VALHALLA SCIENTIFIC	
SCALE: NONE	APPROVED BY:
DATE: 9/12/77	DRAWN BY: FLW
MODEL 4314A	REVISED
	DRAWING NUMBER: 4314-070

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
6I6	K	ADDED R121 + Q17 DPM	3-21-85	

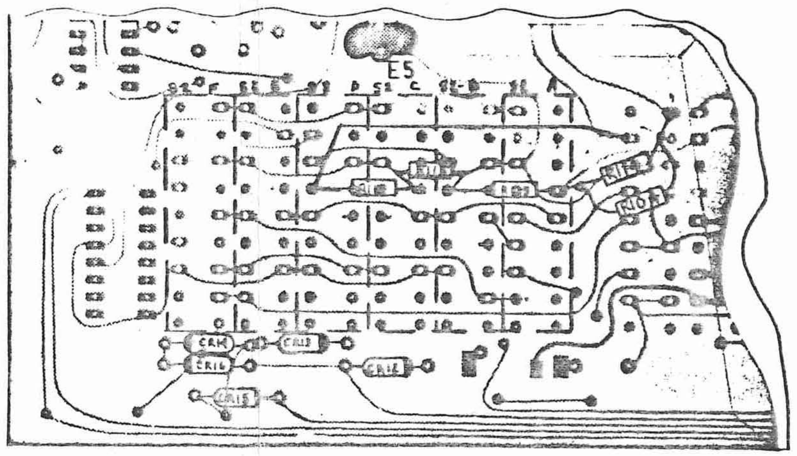


SHOWN IS PC BOARD ASSEMBLY 4314B-700
(CLAD SHOWN IS FARSIDE)

NOTE:
Q17 AND R121 MOUNT ON THE FARSIDE OF THE BOARD.
MOUNT R121 BETWEEN E1 AND THE COLLECTOR OF Q17. THE EMITTER OF Q17 CONNECTS TO E6. THE BASE OF Q17 CONNECTS TO PIN 4 OF IC5.
SLEEVE ALL LEADS.



ALL TRANSISTORS AND TO-18
Q1, IC12, IC13, IC14, IC17,



VIEW FROM BOTTOM OF P.C.B.
(CLAD SHOWN IS NEARSIDE)

NOTES:
5. USE PARTS LIST 4314-400.
4. USE P.C. BOARD 4440-700
3. FOR ASSEMBLY DIAGRAM SEE 4440-400
2. FOR WIRE TAB TABLE SEE 4314-051
1. FOR SCHEMATIC SEE 4314-070

MATERIAL	DRAWN MC		Valhalla Scientific Inc. SAN DIEGO, CALIFORNIA
	CHECKED RM	6/82	
	APPR. SM	4/05	
FINISH			4314A ASSEMBLY
	SCALE NONE		CODE IDENT NO. 53504 · SIZE D · DRAWING NO. 4314-600 · REV. K
	SHEET 1 OF 1		